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**C^{nth}I^{nth}xyz, TACS, AND AIR BATTLE MANAGEMENT:
THE SEARCH FOR OPERATIONAL DOCTRINE**

by

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**The contents of this paper reflect my own personal views and are not
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Abstract of

**C^{nth}I^{nth}xyz, TACS, AND AIR BATTLE MANAGEMENT:
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Operational doctrine is increasingly important to all the military services. This new importance results from the joint emphasis on doctrine and, given the simultaneous decrease in size and increase in operational taskings experienced by all the services, the need for both the individual services and the entire joint community to understand how each service operate at the operational level of war.

The USAF is now entering its twenty-ninth year since its last edition of operational doctrine was published. The USAF must meet this challenge but its search for operational doctrine faces several impediments. The operational level of air warfare includes not only the traditional air “missions and roles” of counter air, interdiction, close air support, and strategic attack, but also the conceptually confused area of command and control and its offshoots C3, C4I, C4ISR, the Theater Air Control System, and new concepts such as Air Battle Management.

USAF operational doctrine should adopt a new framework to sort out this conceptual confusion. A systems model approach including operational air tasks, functions, organizations, and systems architecture will provide a more coherent model for USAF and joint community understanding of USAF operational doctrine. Operational doctrine is the Air Force’s intellectual entree to the joint force; the Chief of Staff, USAF, should release Air Force Doctrine Document 2, Theater Air Warfare, in draft form, and challenge all airmen to discuss and improve this vital doctrinal bridge to the future.

Introduction

“What do you do?” The genesis of this paper was that rather innocent question broached by a fellow student at the Naval War College. Instead of a simple, direct answer like “I drive ships” or “I fly planes,” my long, rambling response included “equipment” like radar, radios, computers, and scopes, “planes and places” including ABCCC, AWACS, Joint STARS, and Control and Reporting Centers; and “tasks” such as weapons control, surveillance, identification, weapons assignment, and battle direction.¹ His response: “sounds like you’re in C2.”

My answers did sound a lot like “C2.” Yet, the Air Force recently renamed my “Command and Control Operations” career field “Air Battle Managers.” “I manage the air battle,” the obvious answer to my classmate’s question, simply raises more questions: What does it mean to “manage” an air battle?² Does air battle management describe a command and control (C2) function, an organization, or a system architecture? I should be able to answer these questions with some precision; I can’t. As the prospective commander of the “schoolhouse” that trains air battle managers, I had the harrowing thought that some second lieutenant might, with all sincerity, ask me, “I still don’t understand, sir, what do we do?”

At the tactical level my answer is straightforward—largely junior officer tasks. However, most Air Battle Managers support the Joint Force Air Component Commander (JFACC) at the operational level of air warfare where things can be much more murky. Air Battle Managers work at the interface of these two levels of war where the JFACC’s intent is translated through tactical action into results that achieve the Joint Force Commander’s (JFC) objectives. My search for a coherent answer starts with understanding what occurs between the JFACC’s and the tactical results, inside the “box” in figure 1.

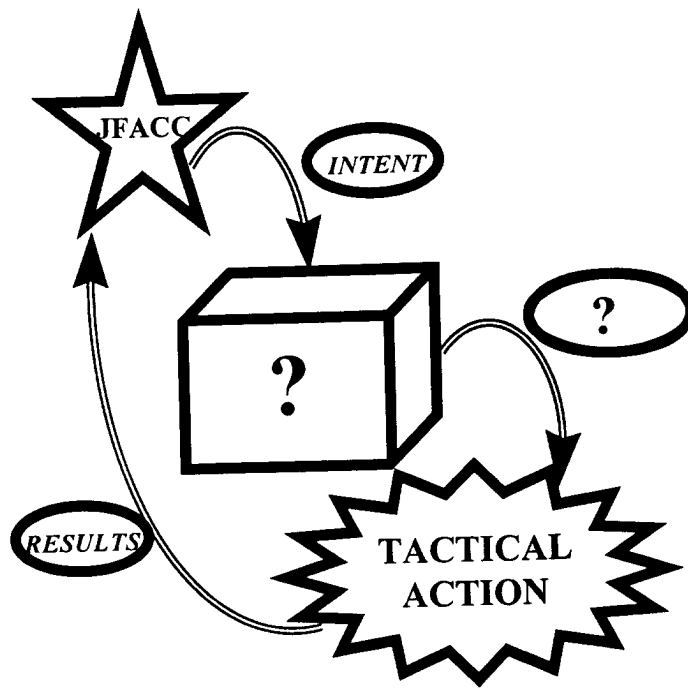


Figure 1. The Link between Intent and Results.

Operational doctrine should, but does not, clarify what occurs in this “box.” The area between the JFACC’s intent and tactical results is, unfortunately, confusing—even for supposed experts. Four “system” models, each with both overlapping and unique elements, vie to explain the operational level of air warfare: air tasks,³ the Theater Air Control System (TACS), command and control (C2) system, and C2’s seemingly never-ending progeny: C3, C4, C4I, and the current C4ISR system. Yet, each provides only a partial explanation.⁴

My search for an answer leads to the conclusion that we need USAF operational doctrine that resolves this conceptual confusion, ends the proliferation of new explanatory constructs and results in a shared understanding of the operational level of air warfare. This paper attempts to develop the first prerequisite for meeting this challenge—a coherent framework for thinking about the “box” in figure 1. After examining why this is important, what’s broken, and why it’s hard to fix, we will address how we fix it and what it could mean for the future. To begin working on “where we are going” and the promise of a “military after next,”⁵ we must first understand “where we are” by establishing a coherent framework for operational doctrine.

The “New” Importance of Doctrine

Because we operate and fight jointly, we must all learn and practice joint doctrine, tactics, techniques, and procedures; feed back to the doctrine process the lessons learned in training, exercises, and operations; and *ensure Service doctrine and procedures are consistent.* Joint Pub 1⁶

Joint Vision 2010 is the conceptual template for how America’s Armed Forces will channel the vitality and innovation of our people and leverage technological opportunities to achieve new levels of effectiveness in joint warfighting. Focused on achieving dominance across the range of military operations through the application of new operational concepts, this template provides *a common direction for our Services in developing their unique capabilities within a joint framework of doctrine* and programs as they prepare to meet an uncertain and challenging future. Joint Vision 2010⁷

These statements by the Chairman of the Joint Chiefs of Staff emphasize the increasingly important role of doctrine to our “joint team.” If the Air Force wants to remain an equal partner in solving the challenges inherent in our quest to achieve Joint Vision 2010, airmen must begin taking doctrine much more seriously. Air Force doctrine is categorized in three variants: basic, operational, and tactical. Basic doctrine presents fundamental “beliefs” about air power, its “tenets” and “attributes.” It also presents the argument for centralized command and control of air power by an airman. Tactical doctrine focuses on specific aircraft and their mission employment, and provides air crew and the airmen who support them a comprehensive weapons system guide for air power execution.

USAF operational doctrine traditionally covers the air operational tasks described as air power roles and missions. Operational doctrine should also impart to all airmen an appreciation of the entire range of activities that comprise operational level air warfare. Additionally, doctrine should provide those members of our “joint team” who employ air power or operate jointly with airmen a clear explanation of what they can expect from air power. The result should be a

common understanding—at the operational level—of “how” the Air Force employs air power to meet the Joint Force Commander’s theater objectives.

The JFACC’s operational art is in translating the Joint Force Commander’s intent into tactical results that support the joint force’s achievement of strategic and theater objectives. The JFACC achieves these results by orchestrating the “when, where, and for what purposes” he employs air power.⁸ The “box” in figure 1 is the arena in which the JFACC conducts this orchestration and comprises the bulk of the operational level. A clear understanding of what occurs inside that “box” is a necessary first step in our search for air operational doctrine.

Operational doctrine is our intellectual entree to the joint force and will define how future Joint Force Commanders and their staffs plan to employ the United States Air Force in future theater contingencies. As Air Force manning shrinks and requirements expand, every airman and, nearly as important, the joint community must understand how we intend to operate not only at the tactical but also at the operational level. Operational doctrine is the key to such understanding.

USAF Operational Doctrine:

What’s Broken and Why Is It So Hard To Fix?

Operational doctrine is both a problem and an opportunity for the Air Force. It’s a problem because we do not presently have any. It is an opportunity for exactly the same reason. Since 1990, the Air Force has had two versions of basic doctrine (with a third in draft), five white papers, and two sets of core competencies. This turbulence of air power thought should have engendered a great deal of internal dialogue. Anyone expecting lively discussion by airmen about air power employment at the operational level in support of the theater commander might

have been disappointed. Instead, the discussion has been more an argument about “roles and missions,” which service is more decisive, and the argument for the JFACC concept, than a theater-oriented introspection on air power as a vital component of the joint warfare team espoused in documents like Joint Publication 1 and Joint Vision 2010.⁹

Fostering dialogue on operational doctrine, the key to creating and improving it, will be tough. It does not appear to be a very “hot” topic. Current vision statements provide some insight into the Air Force leadership’s view of the importance of doctrine. “Doctrine” appears 75 times in the Army vision white paper “Force XXI” and 15 times in “Joint Vision 2010.” The word “doctrine” does not appear at all in our latest Air Force white paper *cum* vision statement, Global Engagement. A word count in no way infers that Air Force senior leadership places little value on doctrine. However, it certainly is not a clarion call for expending ideas and intellectual energy on operational doctrine.

Other, more serious, factors also act to impede development of coherent doctrine. The USAF issued our “current” operational doctrine, Air Force Manual 2-1, on 2 May 1969. The fact that our operational doctrine has been around longer than our entire force cannot be a good omen for the future. Even though the 1994 JFACC Primer referenced the proposed USAF operational doctrine Air Force Doctrine Document (AFDD 2), Theater Air Warfare, it is still in draft status and not releasable. The current “close-hold, until released from on high” approach to developing doctrine will result in neither dialogue nor the “ownership” that might result from open discussion by those who must implement and use it.¹⁰

Comparing the salience of different levels of doctrine have with individual airmen is another possible measure of their value. Only the Air Force’s tactical doctrine, Multi-Command

Manual 3-1, seems to excite interest. Why? The Fighter Weapons School continuously updates this multi-volume, aircraft-oriented document, and, most importantly, Air Force personnel read it and use it. The Fighter Weapons School Review provides an important, accessible vehicle for airmen to write about and be heard in the on-going development process. Young officers (and perhaps many of their elders) care about what goes into this document because it has a direct impact on how we “fly and fight.” Unfortunately, no comparable vehicle or level of interest exists at the operational level.¹¹

This is partly due to the unique organizational structure of the Air Force that also acts as an impediment to operational doctrine development. A survey of Air Force doctrine might give the impression that employing air power begins and ends with tasking squadrons and wings to fly sorties against the right targets with the right weapons.¹² The echelon above the wing is the numbered air force that is also the only Air Force command echelon at the operational level. Numbered Air Force commanders, the officers normally tasked as Air Force Joint Force Air Component Commanders, are first exposed to the operational level when assigned to it with overall command responsibility.

Few “future JFACCs” spend one or more tours on numbered air force staffs learning operational art at the operational level. Conversely, Army and Marine Corps officers must succeed at the operational level early in their careers in order to succeed. By the time they are majors, these officers are usually already conversant with their service operational doctrine (and well equipped to explain and defend that doctrine in the joint community). Air Force majors, on the other hand, (especially those “on track” to be a future JFACC) will probably have served at

the squadron and wing levels and then moved to the major command or Air Staff level, bypassing the operational level entirely—until they become JFACCs.¹³

The reader may be wondering why the author is so excited. “Okay, operational doctrine is important. Got it. It’s coming, a little slow, but it’s coming. After it’s on the street write your paper. Next issue...” Unfortunately, if our history is any guide, once issued it will close off interest in debate and may be a very long time before it’s revisited. A good guide to what AFDD 2 might include is the “prospectus” included in the 1994 JFACC Primer:

This manual outlines operational objectives for theater air forces; **command, control, communications, and intelligence requirements**; and theater air missions. It applies the basic principles in AFM 1-1 to specific requirements for conducting theater air warfare.... The manual defines JFACC responsibilities for recommending apportionment to the JFC; and after the JFC’s decision, allocating air assets via the Air Tasking Order (ATO) and **controlling the air effort through the Theater Air Control System (TACS)**.¹⁴

Missing from this “prospectus” is the intention to describe the operational level as a coherent whole. We may assume from this description that AFDD 2 will “outline” theater objectives, C3I requirements, and air missions, and “define JFACC’s responsibilities” for apportioning, allocating, tasking, and controlling the air effort. Does that cover everything that happens in our box? Will it provide all airmen and their joint brethren a comprehensive understanding of their responsibilities for the full range of actions necessary to “conduct theater air warfare”? No, several important elements of the JFACC’s operational level task are missing.

What is missing? Following the above description of operational doctrine, the output of our “box” would consist simply of tasking and control of “the air effort.” First, this misses the critical commander’s estimate of the situation process and its result, the Joint Air Operations Plan. Also missing is an explanation that goes beyond the “JFACC’s responsibilities” and

explains the “who” and “how” of “C3I requirements,” “tasking orders,” and “control.” This can and should be done in a comprehensive, understandable manner. However, it requires that operational doctrine go beyond the JFACC to the organizations and people who must accomplish the operational functions and the systems in which they function.

This brings us to a final impediment to developing operational doctrine: the conceptual confusion among the three “systems” models—the TACS, C2, and C4ISR. One reason we have created new concepts (e.g., C4ISR (from C4I) and BM/C2) is the unmet need for a unifying conceptualization of the organizations, functions, and system architectural capabilities inferred in these acronyms. To begin to sort out this confusion, we can compare and contrast their joint approved definitions and discover what is unique to each and where the overlap exists.¹⁵

Unfortunately, this approach does not solve our problem. All three definitions focus on the commander and include (the same) organizations, people, equipment, systems, facilities, and communications. Both the TACS and C2 have the purpose of planning, directing, and controlling operations. C4 and C2 include procedures—also implicit in the TACS definition. Comparison of the three definitions indicates that they have very large areas of conceptual redundancy. Contrasting the three provides only the notion that the TACS is the Air Force C2 system (with an emphasis on the “control” of operations). “C4 systems” are definitionally unique only in the addition of the idea of “integrated” systems which “support” commanders.

While this analysis does not provide many answers, it does illustrate why the three models are so difficult to differentiate, and why official documents often use them interchangeably. We are left to approach our “box” from a non-definitional perspective and

attempt to define a generic system that might fulfill our requirements for a coherent, unifying concept.

Doctrine for the Operational Level of Air Warfare

How Do We Fix It?

Both USAF basic and operational doctrine will, when released, undoubtedly adequately cover the air tasks. They are well understood both within the Air Force and in the joint community. We can begin to rebuild our conceptual model of the operational level with this air task model:

- ◆ **Air Tasks.** The air task system model includes the traditional air tasks of counter air, air interdiction, close air support, and strategic attack.

As to our remaining three systems, it may seem to the reader that all we have demonstrated is that we have three names for the same thing—command and control. However, the actual (versus definitionally-derived) purposes underlying these concepts are as different as those of the counter air, interdiction, close air support, and strategic attack air tasks. At one level of abstraction these air tasks may seem the same. After all, each involves delivering ordnance from aircraft, but at the operational level the distinctions are fundamental. This distinction is the differing contributions each makes to establishing the conditions necessary for meeting the JFC's objectives. Similarly, we must understand the distinctions among the TACS, C4ISR, and C2 systems and clearly differentiate them in our operational doctrine.

It would take a paper at least as long as this one simply to sort out the meanings of all the acronyms associated with these three “systems,” or what they seem to mean. “Seem to mean” because they are freely interchanged (and proliferated) without precision, denying us the ability to speak clearly about the operational level of air warfare. We can, however, classify this system

melange into three distinct categories—functions, organizations, and system architecture. We will then apply a “best fit” approach to each separate system that will allow us to deconflict and reformulate the operational level into a single system.

Due to their conceptual overlap and redundancy, neither C2, TACS, nor C4ISR models individually provides a comprehensive basis for operational thinking about the entity through which the JFACC employs air power. Yet, each of these three systems has a distinct (though incomplete) place in our conceptualization of the operational level. We will now examine each separately, determine each model’s core conceptual value to our quest, then attempt to reformulate the four pieces as a coherent whole using a task, function, organization, and system architecture model. First, we will look at C2.

Command and Control

command and control system--The facilities, equipment, communications, procedures, and personnel essential to a commander for **planning, directing, and controlling operations** of assigned forces pursuant to the missions assigned.¹⁶

Joint Pub 3-0 outlines four basic questions which operational art should resolve:

- (1) What military conditions must be created in order to realize the strategic objective?
- (2) What sequence of events must occur in order to create the required conditions?
- (3) How should forces and resources be used in order to make the sequence happen?
- (4) What degree of risk is acceptable at each stage of the enterprise?¹⁷

These questions describe the “planning output” we should expect from the “missing link” in figure 1. Operational planning guides¹⁸ apply this process to air operations planning without reference to either C2, the TACS, or C4ISR. While the relationship may be implied, it is essential that operational doctrine both explicitly make that linkage and explain the four C2 functions in terms that all airmen and the joint audience can understand. The concept of a “C2 system” provides this commonly understood and accepted conceptual framework.

The emphasized words in the joint definition of a “command and control system” demonstrates a common functional thread running through the definitions of all three systems. This thread simply and comprehensively explains what occurs within our “box” and provides a straightforward link to the products necessary for success. Operational level air power employment depends upon the planning, directing, and controlling of air tasks in the execution of air operations.

1. **Planning** – The planning function is executed through the commander’s estimate of the situation process and results in the development of the Joint Air Operations Plan.
2. **Directing** – The directing function is the translation of the JFACC’s intent and concept of operations outlined in the Joint Air Operations Plan into an Air Tasking Order. Directing is principally a sortie allocation, weaponeering and targeting function, augmented by “real-time” changes made during air task execution.
3. **Controlling** – The controlling function is the extension of the JFACC’s authority over operations by monitoring, restraining, and adapting ATO execution of air tasks. Its operational purpose is to maintain centralized control of execution of the JFACC’s planned and directed operational concept.
4. **Operations** – The operations function is the air task execution of the JFACC’s intent. This intent is outlined in the Joint Air Operation Plan’s concept of operations and directed by the ATO to achieve tactical results that achieve the JFC’s operational objectives.

Incorporating these four descriptions, the second piece of our conceptual model results:

♦ **Functions.** The functions model includes the operational level planning, directing, and controlling of operations. These functions establish the conditions necessary for the air task model’s tactical results to achieve the JFC’s objectives.

The personnel who accomplish the planning, directing, and controlling operations functions of the C2 system are members of the Theater Air Control System. This second competing systems concept has existed since the World War II birth of radar.

Theater Air Control System

It has been nearly fifty-five years since a group of airmen in the North African desert, faced with the debacle of Kasserine and the perceived misuse of air power, wrote Field Manual 100-20, Command and Employment of Air Power.¹⁹ Field Manual 100-20 provided the starting point for understanding the Theater Air Control System:

First Priority.—The primary aim of the tactical air force is to obtain and maintain air superiority in the theater. **The first prerequisite for the attainment of air supremacy is the establishment of a fighter defense and offense, including RDF (radio direction finding), GCI (ground control interception), and other types of radar equipment essential for the detection of enemy aircraft and control of our own.**²⁰

FM 100-20 originated the idea that essential to achieving air superiority is the “establishment of a fighter defense and offense” which depends on equipment capable of “detection” of the enemy and “control” of friendly aircraft. This description of equipment and personnel is the doctrinal birth of what we now call the Theater Air Control System.

A great deal was written about the TACS during the 1970s and 1980s. However, the Air Force produced very little “doctrine” since to explain “how” the TACS employs air at the operational level. Official publications, primarily the 55-4X series of regulations issued by Tactical Air Command, described in great detail the manning, equipment, responsibilities and relationships of the many TACS elements. Unfortunately, more recent publications such as the 1992 version of basic doctrine and the JFACC Primer barely mention the TACS.²¹

Nevertheless, we are today doctrinally clear—on both service and joint levels—on the idea that the Theater Air Control System extends the JFACC's authority throughout the theater of operations. The TACS has expanded to include not just the FM 100-20 capabilities to detect and control but also all the organizations which plan, direct, and control air operations. The core role of the Theater Air Control System for our effort, then, is its organizational nature.²²

From our treatment of the functional model, we can conclude that the operational functions accomplished by the people in the organizations of the Theater Air **Control** System include all four **command and control** functions—planning, directing, and controlling operations—not just control. Thus, a more accurate description of this organizational model would be the “Theater Air Command and Control System. (TACCS)” We might, then, tentatively define the “organizational” model within our overall concept as the TACCS:

♦ **Organization:** The organization model includes all units subordinate to the JFACC which extend his authority throughout the theater. The TACCS, using the capabilities provided through the systems architecture model, performs the functions of planning, directing, and controlling air task operations to achieve JFC objectives.

Multiple “systems” provide the “capabilities” in our description. These systems, which exist independently from the TACCS, nevertheless have the core purpose of providing the information support necessary for the TACCS to achieve the C2 functions. These systems must be conceptually and technically arranged in a “systems architecture.”

C^{nth}I^{nth}xyz.....

Command, Control, Communications, Computer,

Intelligence, Surveillance and Reconnaissance

Originally, command, the function of authority and leadership on the battlefield, expanded to command and control to explain the process commanders used to exercise their

authority and leadership throughout the expanding space of modern battlefields.²³ Driven in part by the size and complexity of cold war force structures and the technical aspects of the emergence of electronics as a contributing factor in warfare, another large body of work grew during the 1970s and 1980s which explained this change by extending the C2 concept to command, control and communications (C3). This extension of C2 to C3 was originally a scientific-engineering conceptualization.²⁴

C3 took on a systems architecture orientation. It attempted to explain how the burgeoning electronic systems support structure necessary to employ new technology would be integrated with current systems while achieving the necessary degree of interoperability to allow the proliferating systems to share information. The addition of “computers” (ergo C4) was in keeping with this systems architecture approach; then came intelligence, integration, and interoperability. Depending on which source you consulted at the time, it appeared we should just call whatever this “thing” was $C^{nth}I^{nth}_{xyz}$.

C3, C4, C4I, C4ISR and all their variants are fundamentally scientific representations of sets of electronic hardware and software interoperability and integration interactions—an architecture. This "architecture" allows the scientist and engineer to make generalizations about that which they otherwise cannot generalize and, therefore, cannot use to explain other phenomena. This process is legitimate for the furtherance of science, it is problematic for warriors trying to survive in the most chaotic of environments—combat. None of these acronyms represent actual objects. They exist as aids to understanding—heuristics not actual systems. Thus they are inappropriate as doctrinal bases upon which to build a clear understanding of operational level air power employment.²⁵

This expanding conceptualization of systems supporting the air commander has now stabilized at C4ISR—command, control, communications, computers, intelligence, surveillance, and reconnaissance. There have been many efforts over the last decade to help USAF senior leaders “get their hands around” these conceptualizations. Strategy to Task study groups, Theater Battle Management general officer steering groups, the current C2 Task Force, and the recent four-star C2 Summits are only a few of many such examples. This high level emphasis indicates that USAF leadership sees the potential benefit in these “systems” conceptualizations. It also indicates they are unsure how to maximize that potential or fully integrate C4ISR in air power employment.

Intelligence, surveillance, reconnaissance, and communications systems are conceptually different from command, control, or computers. Intelligence, surveillance, reconnaissance, and communications are distinct systems. Computers, while essential to each of the other elements, do not exist as a separate “system.” Control is a function, while command is an authority; neither is an independent “system” apart from the TACCS. Additionally, if we establish the criteria of “technology-based system capabilities that support the air operation,” and we include intelligence, surveillance, and reconnaissance, then why wouldn’t we also include, at a minimum, logistics.²⁶ Perhaps the best solution is to discard the $C^{nth}I^{nth}xyz$ approach and adopt the model of a:

♦ **Systems Architecture.** The systems architecture model provides the Theater Air Command and Control System connectivity, interoperability, and integration of all technology-based system capabilities supporting the theater air component’s operational level air task, functional and organizational models.

What's the Solution? A New Model for Operational Doctrine

We have redefined the operational level requirements to achieve the JFACC's intent through a systems model of air task, functions, organization, and systems architecture models. We are now ready to look back at our "box" and see what this reformulated model looks like.

Figure 2 depicts our new box, while our four systems provide a descriptive model:

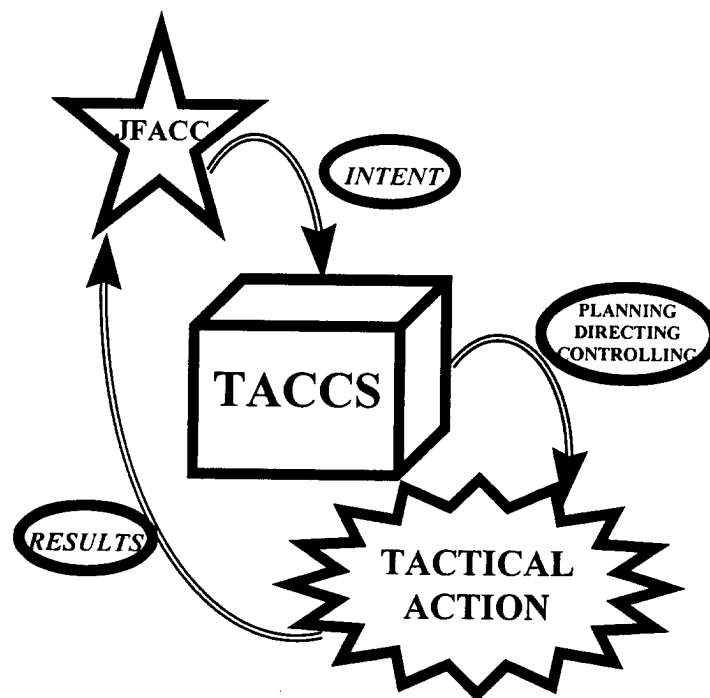


Figure 2. The Link between Intent and Results.

- ◆ **Air Tasks.** The air task system model includes the traditional air tasks of counter air, air interdiction, close air support, and strategic attack.
- ◆ **Functions.** The functions model includes the operational level planning, directing, and controlling of operations. These functions establish the conditions necessary for the air task model's tactical results to achieve the JFC's objectives.
- ◆ **Organization.** The organization model includes all units subordinate to the JFACC which extend his authority throughout the theater. The TACCS, using the capabilities provided through the systems architecture model, performs the functions of planning, directing, and controlling air task operations to achieve JFC objectives.
- ◆ **Systems Architecture.** The systems architecture model provides the Theater Air Command and Control System connectivity, interoperability, and integration of all technology-based system capabilities supporting the theater air component's operational level air task, functional and organizational models.

Counterarguments

Informal discussions with action officers involved in developing the Air Force's new operational doctrine, AFDD 2, indicate one possible outline would suggest including "C4ISR" as an air power "function" on the same level with air tasks. This approach would go one step farther than that suggested here by, in effect, blurring the distinction between command and control and the operational tasks traditionally seen as the object of C2. The merit of this approach is that it is consistent with the idea that successful air operations only result from the combined effects of each separate task. For example, the counter air mission is only "successful" when it "enables" strategic attack, air interdiction, and close air support. This would be consistent with the idea that "C4ISR" enables the other air tasks. However, this approach does not clarify the confusion about C4ISR's relationship to the TACS and is inconsistent with the manner in which the joint community approaches the concept of a C2 system.

We see a similar approach in a recent message from the Commander of Air Combat Command, announcing the stand-up of the "Air and Space Command and Control Agency." This message calls for "an Air Force-wide commitment to focus resources and treat C2 as a weapons system...."²⁷ Treating C4ISR as a weapons system certainly will "focus resources." It also has a great deal of merit as a precursor for thinking about C4ISR as a conceptual template for information warfare and 21st Century Global Engagement capabilities. However, even if we accept the possible value of "operationalizing" C4ISR and its connotation of a "system of systems" architecture with future potential, calling anything a "weapons system" implies a hard (or soft) kill capability which C4ISR does not yet provide.

A final counterargument is that the concept of “battle management/C2” is exactly what the “TACCS” implies and we do not need another acronym. We certainly don’t need new acronyms, which is one of the advantages of TACCS over BM/C2. The joint community understands “TACS.” By adding another “C” this paper intentionally avoided the temptation to “create a new concept,” precisely because more is not better in the semantic soup of our current acronym-rich environment. Additionally, no accepted definition of BM/C2 exists. A trip report from a recent numbered air force “battle management working group” contained the observation that “the battle management working group charter is to improve battle management for the CINCs. At this time, however, the working group does not have a definition of battle management.” Pushing BM/C2 into the joint lexicon is an unnecessary and counterproductive approach to the search for clarity.

Conclusions

1. Operational doctrine is critically important to the USAF role as a vital member of the joint team. This new importance results from the joint focus on doctrine and the need for the entire joint community to understand how the USAF operates at operational level of war.
2. Decreasing manning and increasing taskings reinforces the requirement that we eliminate functional redundancy and that all airmen to understand their role in Air Force operations.
3. USAF is not sufficiently “focused” on the need for or value of operational doctrine because of the lack of leadership emphasis and promotion of discussion and dialogue. Conceptual confusion about the many overlapping “systems” involved in the operational level of air warfare in part leads to this apparent disinterest.

4. The USAF needs a new framework for operational doctrine that includes the air tasks, functions, organizations, and the systems architecture necessary for success at the operational level of air warfare.

Recommendations

1. Chief of Staff, USAF, should release AFDD 2 as a working draft and explain its vital role in our future. He should challenge all airmen to accept “ownership” by openly discussing and, thereby, improving our operational doctrine. He should also direct the Air Force Doctrine Center to establish an Internet forum for discussion of air power doctrinal issues.
2. USAF operational doctrine should establish a comprehensive framework for the operational level which includes four system models: operational air tasks, functions, organization, and systems architecture.
3. USAF operational doctrine should establish the Theater Air Command and Control System as the benchmark for developing new operational air task, function, organization, and system architectural forms. These new forms may allow us to break away from hierarchical pre-information age constructs and approach a new model for accomplishing the timeless requirements to plan, direct, and control air operations.²⁸

Summary

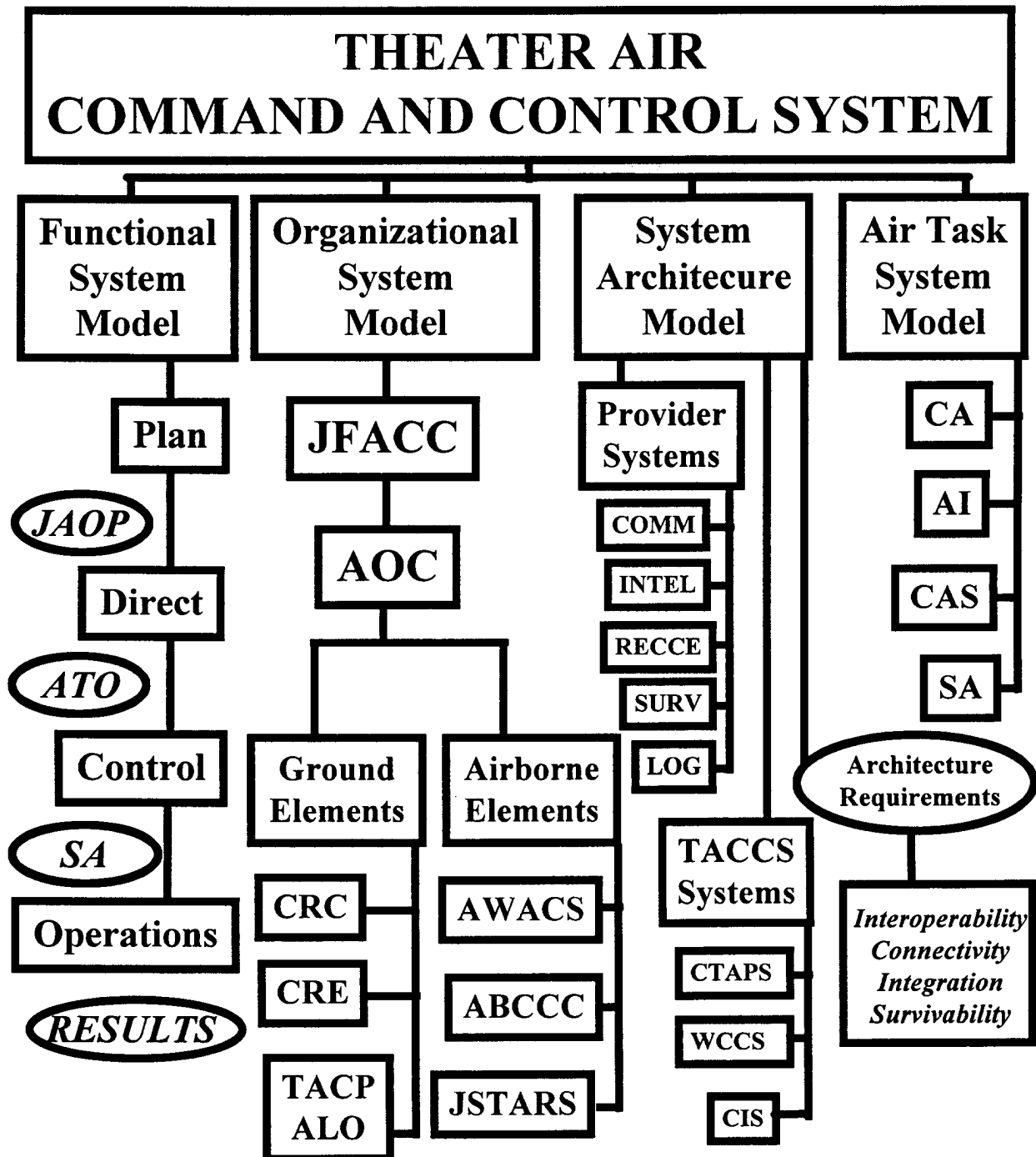
Air Force operational doctrine should comprehensively explain the functions of planning, directing, and controlling air task operations that result in tactical actions that achieve the Joint Force Commander’s operational objectives. These C2 operational functions are executed through the organizational dynamic of the Theater Air Command and Control System and supported by the technical system capabilities of communications, intelligence, reconnaissance,

surveillance, and logistics systems, enabled by the connectivity, integration, and interoperability of the TACCS systems architecture. This conceptualization of operational air tasks, functions, organizations and architecture provides all airmen and the joint community a common framework for understanding air power employment at the operational level of air war.

My answer to the lieutenant's "what do we do?" question has four parts:

1. The air battle manager serves in all the units of the Theater Air Command and Control System organization at both the tactical and operational levels of war.
2. The air battle manager (1) "plans" implementation of the JFACC's intent as a part of the TACCS commander's estimate of the situation planning team; (2) "directs" air tasking order execution and makes changes during the air battle through "real-time" decisions to air task execution; and (3) "controls" execution of air task operations as an operational level extension of the Joint Force Air Component Commander's authority to ensure the tactical action results achieve the Joint Force Commander's theater objectives.
3. The air battle manager accomplishes these operational functions through the capabilities of intelligence, communications, surveillance, reconnaissance, and logistics systems and "manages" those parts of that systems architecture assigned to his or her responsibility as a member of the TACCS.
4. Finally, the air battle manager of the 21st Century must begin to think today about this system, where it is synchronized and where it is misaligned. When all parts of the TACCS are technologically, functionally, and organizationally aligned we can begin to think about the possibilities for the future of the Theater Air Command and Control System.

APPENDIX A



NOTES

¹ ABCCC (Airborne Command and Control Center), AWACS (Airborne Warning and Control System), and Joint STARS (Surveillance Target Attack Radar System) and the Control and Reporting Center (CRC) are all elements of the Theater Air Control System. The best sources for explanations of these systems and the history of the Theater Air Control System are Majors Kevin N. Dunleavy and Lester C. Ferguson, “Command and Control and the Doctrinal Basis of the Theater Air Control System,” in *Concepts in Airpower for the Campaign Planner* (Maxwell AFB, AL: Air Command and Staff College 1993), 123-148; Lt Col Robert J. Blunden, Jr., USAF, *Tailoring the Tactical Air Control System for Smaller-Scale Contingencies* (Maxwell AFB, AL: Air University Press 1992); Lt Col Robert J. Blunden, Jr., USAF, *Tailoring the Tactical Air Control System for Contingencies* (Maxwell AFB, AL: Air University Press 1992); Lt Col David Tillotson III, USAF, *Restructuring the Air Operations Center A Defense of Orthodoxy* (Maxwell AFB, AL: Air University Press 1993); Lt Col J. Taylor Sink, USAF, *Rethinking the Air Operations Center* (Maxwell AFB, AL: Air University Press 1994); and Lt Col Richard T. Reynolds, USAF, *What Fighter Pilots’ Mothers Never Told Them About Tactical Command and Control—and Certainly Should Have...* (Cambridge, MA: Center for Information Policy Research, Harvard University 1991).

² Both “manage” and “battle” are problematic descriptors. This paper deals with “things” and “systems,” as well as people. People must be led; things and systems can only be managed. Whether we control—my preference—or manage air battles, engagements, or—my preference—operations—are important distinctions. For the purposes of this paper; however, this comes too close to unnecessarily tilting at too many “acronym-windmills.” We must do enough of that in this paper, so I’ll leave this fight for another day.

³ Normally referred to as air “missions and roles” in USAF doctrinal publications. According to action officers involved, the next edition of AFDD 1 will correct this misnomer, changing “roles and missions” to “tasks.”

⁴ Battle Management/C2 (BM/C2), another as-yet-undefined candidate, has now joined the fray. Making matters worse, the proliferation of vague, future vision constructs leave those of us who sense we may be charged with implementing these visions the uneasy feeling that perhaps we should figure out exactly where we are before we charge off into the 21st Century. Progress towards the promises of next century visions requires this first critical step—we must understand what happens inside this “box” now to enable the changes implicit in “battlespace dominance” based on “global battlespace awareness” and “information superiority.”

⁵ The emergence of new concepts such as Joint Vision 2010’s “dominant battlespace awareness” and “information superiority,” also an Air Force Global Engagement core competency, are threatening to completely overrun an already conceptually confused arena. According to Global Engagement, the Air Force’s commitment to “information superiority” will provide “the integrated global and theater air, space and surface picture of the battlespace to the 21st Century

Joint Force Commander. Moreover, its future Battle Management/Command and Control (BM/C2) systems will enable real-time control and execution of all air and space missions.” While we might excuse vision-writing staff officers from excessive acronym-building, the proliferation of these new concepts threatens to leave us with nothing but undefined word strings. I doubt that anyone is sure exactly what a “Battle Management/Command and Control” is or how it differs from either our current Theater Air Control System or C4ISR, but it is clear that the conceptual completeness and centrality of the TACS is on the wane. Much of this is simply a problem of language discipline. We have possibly created a semantic soup of acronyms which both substitutes for understanding and makes clear thinking and, therefore, discussion nearly impossible. Chairman of the Joint Chiefs of Staff, *Joint Vision 2010* (Washington, DC: Government Printing Office 1996), 13. Department of the United States Air Force, *Global Engagement: A Vision for the 21st Century Air Force* (Washington, DC: Government Printing Office 1996), 14.

⁶ Joint Chiefs of Staff, *Joint Pub 1 Joint Warfare of the Armed Forces of the United States* (Washington, DC: Government Printing Office 1995), I-4 (emphasis added).

⁷ *Joint Vision 2010*, 1 (emphasis added).

⁸ Air Force Manual 1-1, Basic Aerospace Doctrine, Section B Aerospace Operational Art, states that “the essence of aerospace operational art is the planning and employment of air and space assets to maximize their contribution to the combatant commander’s intent. Aerospace power may be employed independently of or in conjunction with surface operations. The air component commander’s exercise of operational art involves four tasks. The first is envisioning the theater and determining when and where to apply what force in concert with the combatant commander. The next is creating conditions that give units applying force the best chance of success. The third is directing adjustments to operations in accordance with mission results and the operational commander’s revised intent. The final is exploiting the often fleeting opportunities that result from combat. In each task, the key to success lies in an air component commander’s ability to achieve objectives by orchestrating aerospace roles and missions so they produce a mutually reinforcing effect.” US Department of the Air Force, *Basic Aerospace Doctrine of the United States Air Force, AFM 1-1*, Vol I. (Washington, DC: Government Printing Office 1992), 10.

⁹ This is not to say that these issues were (and are) not vitally important; only that they nearly monopolized the arena of air power discussion.

¹⁰ While revisions to both basic and operational doctrine will be vetted through the major commands, it is remarkable that students at our senior service schools are denied access to drafts.

¹¹ Airmen are fond of asserting our unique perspective on warfare resulting from operating in the third dimension with its inherent attributes of speed and altitude. There is another difference. It begins with the tenet of centralized control and decentralized execution and results in an actual difference in our perspective on C2. The JFACC is physically separated from the actual

execution of air power. Both naval and ground commanders move with their forces inside their own scheme of maneuver. The JFACC, along with the TACS, is largely static. Another (politically incorrect) impediment explaining the apparent lack of interest by senior USAF leaders in operational doctrine is the reality that our “box” does not include the act of flying. Perhaps this explains the 1969 version of operational doctrine being little more than an extended discussion of basic doctrinal treatment of air “roles and missions.”

¹² These two tasks—targeting and flying—and their tactical results are at the core of air power employment; they are not, however, the only subject worthy of considerable explanation in our operational doctrine. Command and control, under whatever guise, is not even mentioned within the roles and missions framework. The Air Force-developed Joint Publication 3-56.1, *Command and Control of Joint Air Operations*, provides an excellent illustration of this overemphasis. The major portion of JP 3-56.1 is taken up by discussion of JFACC authority, organization, and targeting. Another excellent example of this “bias” in operational thinking is found in Col Phillip S. Meilinger’s Proposition 4: “In essence, Air Power is targeting, targeting is intelligence, and intelligence is analyzing the effects of air operations.” Col Phillip S. Meilinger, *10 Propositions Regarding Air Power* (Washington, DC: Air Force History and Museums Program 1995), 20.

¹³ Some progress has been made in this area. Some of the School of Advanced Airpower Studies graduates are now assigned directly to numbered air forces. This policy will, no doubt, have long term positive results on the development of operational doctrine as these officers become the JFACCs of the future. However, this positive development remains ten years in the future.

¹⁴ Department of the United States Air Force, *JFACC Primer*, Second Edition (Washington, DC: Government Printing Office 1994), 56 (emphasis added).

¹⁵ The three definitions from Joint Pub 1-02:

tactical air control system--The organization and equipment necessary to plan, direct, and control tactical air operations and to coordinate air operations with other Services. It is composed of control agencies and communications-electronics facilities which provide the means for centralized control and decentralized execution of missions. (The Air Force changed “tactical” to “theater” in 1992).

command, control, communications, and computer systems--Integrated systems of doctrine, procedures, organizational structures, personnel, equipment, facilities, and communications designed to support a commander's exercise of command and control across the range of military operations.

command and control system--The facilities, equipment, communications, procedures, and personnel essential to a commander for planning, directing, and controlling operations of assigned forces pursuant to the missions assigned. Joint Chiefs of Staff, *Joint Pub 1-02, Department of Defense Dictionary of Military and Associated Terms* (Washington, DC: Government Printing Office 1994), 79.

¹⁶ Ibid., 78.

¹⁷ Joint Chiefs of Staff, *Joint Pub 3-0, Doctrine for Joint Operations* (Washington, DC: Government Printing Office 1995), II-3.

¹⁸ Joint Doctrine Air Campaign Course Faculty, *Air Campaign Planning Handbook* (Maxwell AFB, AL: Air University 1995).

¹⁹ Maj David A. Dellavolpe, USAF, "Command and Control of Tactical Air Forces, North Africa: 1942-1943," *Theater Warfare Studies*, Vol. 9A (Maxwell AFB, AL: Air Command and Staff College 1992), 173.

²⁰ War Department, *Command and Employment of Air Power, FM 100-20* (Washington, DC: Government Printing Office 1943), 16 (emphasis added).

²¹ The JFACC Primer, the Air Force's explanation of "how to best organize, plan and execute joint air operations" provides the following description of the TACS: "The JFACC's primary means of executing assigned duties is the TACS." Other than describing the Air Operations Center as the "JFACC's command post" and warning about the reliability of the "composite recognizable air picture," this "primer" merely outlines the JFACC's "responsibility for putting together a rational command, control, and intelligence system that allows him to accomplish the Joint Force Commander's directives." *JFACC Primer*, 26.

²² Perhaps the best evidence available for determining the core role of the TACS as a concept for our reformulation effort is simply that people assigned to organizations involved in what might be called the C2, C3, or C4ISR "business" are much more likely to say "I'm assigned to the TACS" or "I'm in a TACS unit" than "I'm assigned to a C2 (or C4ISR) unit."

²³ For history and development of "command and control," see Thomas P. Coakley, *Command and Control for War and Peace* (Washington, DC: National Defense University Press 1992); C. Kenneth Allard, *Command, Control, and the Common Defense* (New Haven, CT, Yale University Press 1990); Roger Beaumont, *The Nerves of War: Emerging Issues in and References to Command and Control* (Washington, DC: AFCEA International Press 1986); Martin van Creveld, and *Command in War* (Cambridge, MA: Harvard University Press 1985).

²⁴ C3's "birth" was due to a combination of the civilianization of military thought, the resulting professional requirement for defense academics to publish (and therefore write papers in which connected ideas were continuously re-explained with new approaches), and the scientific-engineering community's need to develop new constructs to explain inadequate paradigms. Engineers and scientists from various fields applied concepts from their disparate, previously-mastered disciplines (such as cybernetics, stochastic processes, and systems technology) to the emerging interdisciplinary field of military electronics. This process was, no doubt, quite useful to the scientific community; but it has made life difficult for warriors. For an overview of the

conceptual development of “C3I,” see George E. Orr, *Combat Operations C3I: Fundamentals and Interactions* (Maxwell AFB, AL: Air University Press 1983) and John Hwang, ed., *Selected Analytical Concepts in Command and Control* (New York: Gordon and Breach Science Publishers 1982).

²⁵ We are all familiar with apparently good ideas which didn’t pan out and were either thrown in the acronym trash heap or reconceptualized. (EC (electronic combat), BAI (battlefield air interdiction), C3CM (command, control and communications counter measures), ECCM (electronic counter counter measures), and so on.) $C^{nth}I^{nth}_{xyz}$ is directly tied to technology and thus is able to continually regenerate itself every few years, with no diminution of its growth potential in sight. Instead of demanding that concepts with no (or only marginal) utility for fighting be discarded, the military has accepted $C^{nth}I^{nth}_{xyz}$ as if it represented some sort of intellectual holy grail. There is no doubt that our technological environment is gaining daily in complexity, but this should actually drive us to simplify our conceptualization of the operational level of war, not make it increasingly more difficult to understand.

²⁶ A modest proposal. We should add “LODO” to the current C4ISR. In this final conflation we would completely obliterate whatever usefulness such epigrammatic approaches to understanding our operational art may have had. Our tireless penchant for finding shorthand paradigms for waging war would then be complete in our new “command, control, communications, computers, intelligence, surveillance, reconnaissance, logistics, and offensive and defensive operations.” In this utterly useless affectation of understanding we will have totally subsumed war, thereby creating an acronym demonstrating the futility of our search for operational doctrine through the repackaging of acronyms.

²⁷ Air Combat Command . Message released by ACC/CC. Subject: *Air Force Air and Space Command and Control Agency* Langley AFB, VA: 070120Z May 97.

²⁸ An example of where that future may take us: Colonel John R. Boyd provided all airmen a legacy of thought about airpower which is both rich in content and, at least for the present, badly flawed as a guide for our continuing search for air operational doctrine. His conceptual decision cycle of Observe-Orient-Decide-Act is a fighter pilot perspective of decision making as yet not adaptable to our non-flight command and control environment. For all the wondrous advances the microprocessor has wrought C2 remains a manpower-intensive, sequential, deliberative process. A process not yet conducive to the logic of “lead-turning” an opponent’s thought processes. Yet, one only need spend a short time dwelling on Boyd’s “A Discourse on Winning and Losing” to know that there really is something there, but.... To discover what innovation possibilities might exist we must first understand the actual system we operate and not allow future visions to delude us into thinking we’re ready to leap ahead. An important part of the process of clearing the way for the true innovation that might result in adapting Boyd’s ideas to the future of C2 is getting our conceptual house in order. Until we are clear on where we are, we can’t really begin to move out to either the 21st Century or C2’s “fast transient” potential. The construct advanced herein will provide one step down this road. Building on this reformulated

conceptualization, it should be possible to compare the four models and discern their relative states of technological and function adaptability to change and how to improve the whole by bringing the four systems into closer technological alignment. John R. Boyd, "*A Discourse on Winning and Losing*," Collection of Unpublished Briefings and Essays, Air University Document No. M-U 43947, Maxwell AFB, AL: 1987.

BIBLIOGRAPHY

- Air Combat Command. Message released by ACC/CC, Subject: *Air Force Air and Space Command and Control Agency*. Langley AFB, VA: 070120Z May 97.
- Allard, C. Kenneth. *Command, Control, and the Common Defense*. New Haven, CT: Yale University Press, 1990.
- Beaumont, Roger. *The Nerves of War: Emerging Issues in and References to Command and Control*. Washington, DC: AFCEA International Press, 1986.
- Blunden, Robert J. Jr. *Tailoring the Tactical Air Control System for Contingencies*. Maxwell AFB, AL: Air University Press, 1992.
- Blunden, Robert J., Jr. *Tailoring the Tactical Air Control System for Smaller-Scale Contingencies*. Maxwell AFB, AL: Air University Press, 1992.
- Boyd, John R. "A Discourse on Winning and Losing," Collection of unpublished briefings and essays. Maxwell AFB, FL: Air University Library Document No. M-U 43947, 1987.
- Chairman of the Joint Chiefs of Staff. *Joint Vision 2010*. Washington, DC: Government Printing Office, 1996.
- Coakley, Thomas P. *Command and Control for War and Peace*. Washington, DC: National Defense University Press, 1992.
- Dellavolpe, David A. "Command and Control of Tactical Air Forces, North Africa: 1942-1943," *Theater Warfare Studies*, Vol. 9A. Maxwell AFB, AL: Air Command and Staff College, 1992.
- Department of the United States Air Force. *Basic Aerospace Doctrine of the United States Air Force, AFM 1-1*. Vol. I. Washington, DC: Government Printing Office, 1992.
- Department of the United States Air Force. *Global Engagement: A Vision for the 21st Century Air Force*. Washington, DC: Government Printing Office, 1996.
- Department of the United States Air Force. *JFACC Primer, Second Edition*. Washington, DC: Government Printing Office, 1994.
- Dunleavy, Kevin N. and Lester C. Ferguson. "Command and Control and the Doctrinal Basis of the Theater Air Control System," *Concepts in Airpower for the Campaign Planner*. Maxwell AFB, AL: Air Command and Staff College, 1993.

- Hwang, John. ed. *Selected Analytical Concepts in Command and Control*. New York: Gordon and Breach Science Publishers, 1982.
- Joint Chiefs of Staff. *Joint Pub 1, Joint Warfare of the Armed Forces of the United States*. Washington, DC: Government Printing Office, 1995.
- Joint Chiefs of Staff. *Joint Pub 1-02, Department of Defense Dictionary of Military and Associated Terms*. Washington, DC: Government Printing Office, 1994.
- Joint Chiefs of Staff. *Joint Pub 3-0, Doctrine for Joint Operations*. Washington, DC: Government Printing Office, 1995.
- Joint Doctrine Air Campaign Course Faculty. *Air Campaign Planning Handbook*. Maxwell AFB, AL: Air University, 1995.
- Meilinger, Phillip S. *10 Propositions Regarding Air Power*. Washington, DC: Air Force History and Museums Program, 1995.
- Orr, George E. *Combat Operations C3I: Fundamentals and Interactions*. Maxwell AFB, AL: Air University Press, 1983.
- Reynolds, Richard T. *What Fighter Pilots' Mothers Never Told Them About Tactical Command and Control—and Certainly Should Have....* Cambridge, MA: Center for Information Policy Research, Harvard University, 1991.
- Sink, J. Taylor. *Rethinking the Air Operations Center*. Maxwell AFB, AL: Air University Press, 1994.
- Tillotson, David, III. *Restructuring the Air Operations Center, A Defense of Orthodoxy*. Maxwell AFB, AL: Air University Press, 1993.
- U. S. War Department. *Command and Employment of Air Power, FM 100-20*. Washington, DC: Government Printing Office, 1943.
- Van Creveld, Martin. *Command in War*. Cambridge, MA: Harvard University Press, 1985.